



Perchlorate CHEMISTRY



- Highly Oxidized Chlorine
- Dissociated Salt, Anion, in Water
- Highly Soluble, Mobile, Stable
- Difficult to Detect, Difficult to Treat
- Standard Ion Chromatography Method
 - Detection > 400 ppb
 - 1000 ppb in 10 minutes

USES of PERCHLORATE

- 90% Solid Rocket Fuel Oxidizer
- Explosives
- Fireworks and Pyrotechnics
- Reported in Nitrate Fertilizer from Chile



HISTORY - Before 1997

- 1980s - Aware of Perchlorate in CA, NV
- 1985-86 - San Gabriel Valley
- 1990s - Rancho Cordova (ppm)
- 1992-95 - Provisional Reference Dose (ppb range)
- 1997 - Analytical breakthrough



Agency for Toxic Substances and Disease Registry - ATSDR (January 21, 1986):

"...Given the proprietary nature of the laboratory method for quantification and the poor quality assurance results noted, the **data do not prove that perchlorate ion has actually been found**. If the presence of perchlorate ion is confirmed, the **scientific database** on this ion is **insufficient to generate either an acute or longer-term health advisory for drinking water**"

"... The minimal acute toxicity data available suggest that one or two ppm perchlorate ion would not represent an immediately acute and substantial threat to the public health. The ATSDR does not consider this level to be "safe" in the absence of experimental data.."

Analytical Methods



- **Ion Chromatography**
- **Developed by Cal DHS in Feb, 97**
- **Air Force, EPA, States and Private developments and interlab study**
- **Need "Published" Method**
- **Ongoing work on:**
 - **High Salinity Water Samples**
 - **Plant Tissue**
 - **Soil**

Perchlorate TOXICOLOGY



- **Thyroid Disruption (Iodide Mimic)**
- **Human Drug Tests in 1950's**
- **EPA Provisional Reference Dose 1992/95**
Range of 4 to 18 ppb in Drinking Water
- **Childrens Health**
 - **Neonatal Data not Conclusive (Epidem.)**
- **High Uncertainties**

Toxicology



- **Air Force and Industry Sponsors
\$2.5M of Animal Studies**
- **EPA (ORD/NCEA) Review - Dec 98**
- **Peer Review Meeting, Ontario CA,
February 1999**
- **More Results through Sept, Second
Peer Review (IRIS) in early 2000.**

PERCHLORATE in the ENVIRONMENT



- **NEVADA, ARIZONA, UTAH, TEXAS,
ARKANSAS, NEW YORK, MARYLAND, WV**
- **American Water Service Survey**
 - 425 wells tested, detects in 5 states: IA, IN,
PA, NM and
- **CALIFORNIA**
 - Over 500 Water Supply Wells Tested
 - Detected in 144 wells, 38 Wells over 18 ppb

PERCHLORATE SHIPMENTS



- **Manufacturer's Information**
- **About 150 facilities**
- **35+ States**
- **Most Information in Last 20 Years**

COLORADO RIVER and LAKE MEAD



- **Southern California Aqueduct**
- **Lake Havasu (Colorado River)**
- **Lake Mead**
- **Non-Detect Upstream of Lake Mead**
- **CAP, SNWA, MWD, Tribes...**
- **15+ million people**

Treatment Technology



- **Standard GAC of limited use**
- **Focus on Anoxic Bioremediation and Ion Exchange**
- **Reverse Osmosis also works**
- **Treatment Technology work at:**
 - **San Gabriel, Aerojet, JPL-NASA**
 - **Kerr-McGee in Henderson NV**
 - **AWWARF/East Valley Water Distr.**
- **\$2M appropriations in FY98 and 99**

Ecological Risks



- **Direct Effects on Fish/Animals at High Concentrations**
- **Unknown Developmental Effects**
- **Concern for Arid Region Wetlands**
- **Agriculture Uses Colorado R. and GW**
 - **Lettuce near Yuma**
 - **Imperial Valley/Coachella Valley**
 - **Citrus in Riverside**

PERCHLORATE WEB SITES



US EPA -

Interagency Perchlorate Steering Committee:

www.epa.gov /

[ogwdw / ccl / perchlor / perchlo.html](http://www.epa.gov/ogwdw/ccl/perchlor/perchlo.html)

California Dept. of Health Services:

www.dhs.cahwnet.gov (search, or:)

**[/ps / ddwem / chemicals / perchl /
perchlindex.htm](http://www.dhs.cahwnet.gov/ps/ddwem/chemicals/perchl/perchlindex.htm)**